GSFC RECEIVING INSPECTION AND TESTING

A Recommendation from the

Quality Management System Council

Pursuant to Center ISO 9001 Implementation

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1. Introduction

NASA has committed to implementation of ISO 9001 at HQ and the Centers. In addition, the Administrator has directed that GSFC shall be third party registered no later than September 30, 1999 (reference Code A memo, "ISO 9000 Certification", dated Nov. 13, 1996).

Consequently, GSFC has established an ISO 9001 Registration Project of which the Quality Management System Council (QMSC) is responsible for defining and documenting the business processes that most effectively and efficiently implement the ISO standard. ISO 9001 is composed of 20 elements which require the establishment of processes by the supplier (GSFC in this case) to meet certain ends. The elements are interdependent, in that implementation of one is, to varying degrees, dependent upon implementation of the others.

Because of its impact across so many of the elements of ISO 9001, the receiving inspection and test requirement has been the subject of much discussion within the QMSC. The implementation approach taken to implement this requirement will have significant consequences with respect to GSFC's ability to efficiently and consistently satisfy ISO requirements, both to ourselves and to a third party registrar. This paper has been written to solicit GSFC management support for the recommended approach.

The current GSFC registration plan limits the scope of ISO 9001 implementation to orbital flight systems and ground support and mission operations equipment that directly interact with them. This paper is written with that scope in mind.

2. Requirements

With respect to a receiving inspection and testing process, the standard contains several explicit requirements:

- documented procedures
- incoming product must be inspected/verified prior to use or processing
- extent of receiving inspection influenced by subcontractor control and recorded evidence of conformance provided
- controlled urgent (pre-receiving inspection/testing) release of incoming product
    - positive identification and records to accommodate needed recall/replacement
- Receiving inspection and test records

In addition to the above explicit requirements, other elements of ISO 9001 contain requirements which impact or are dependent upon the receiving inspection and testing process. They are:

- establishment/maintenance of quality records of acceptable subcontractors

- definition of the type and extent of control exercised by the supplier (GSFC) over subcontractors (GSFC suppliers)
- control of verification, storage, maintenance of customer-supplied product
- identification of product from receipt and during all stages of production, delivery and installation
- unique, recorded identification of individual product or batches (as required)
- control of nonconforming material
    - identification
    - documentation
    - evaluation
    - segregation
    - disposition
    - notification to concerned functions
- corrective and preventive action
    - investigation of cause (and associated records)
    - corrective action follow-up for application and effectiveness

In addition to the above ISO requirements, there are Federal Acquisition Regulations which impact the receiving inspection and testing process. They are:

- Prompt payment clause (non-complex/routine items)
    - acceptance assumed 7 days after delivery unless contract compliance issues have been raised
- Inspection of Supplies clause
    - The Government shall accept supplies as promptly as practicable after delivery
    - acceptance assumed 60 days after delivery (90 days for research and development)

3. Implementation Options

The QMSC separated the possible receiving inspection and testing process options into three general categories.

3.1 Individual Responsibility (Option A)

In this approach, incoming product is delivered to an individual, typically the procurement initiator, identified in the procurement document. Appropriate environmental controls (e.g., ESD control) and necessary physical space must be provided by the individual. The individual determines the degree of receiving inspection and test, performs or arranges performance of same, and documents results. The individual is also responsible for the control of nonconforming material during this phase, including its identification, segregation, and disposition. Any required corrective action requests to the subcontractor and resulting follow-up actions are the responsibility of this individual. He/she must also document and maintain subcontractor quality records, based upon

receiving inspection and test results and make them known and accessible to other GSFC individuals who receive incoming product. Similarly, he/she must collate data gathered by other GSFC individuals as input into his/her determination of supplier selection, degree of on-site control, and degree/nature of receiving inspection and test. He/she must identify incoming product and provide traceability to its supporting documentation. Timely input to the cognizant Contracting Officer with respect to product acceptability or perceived issues must be provided by the individual. The individual is responsible for establishment and maintenance of all required receiving inspection and test procedures and records.

3.2 Project Responsibility (Option B)

In this approach, incoming product is delivered to a designated receiving inspection and test area provided by the project and identified on project procurement documents. The project is responsible for providing the space and the resources to accomplish this function. Assigned project personnel would be responsible for incoming project product and associated project receiving inspection and test procedures and records. As in option A, responsibility for control of nonconforming hardware, subcontractor corrective action, collection of subcontractor performance data, product identification and traceability, and coordination with applicable Contracting Officers resides with assigned project personnel. Each project is responsible for establishment and maintenance of all required receiving inspection and test procedures and records.

3.3 Center Responsibility (Option C)

In this approach, most receiving inspection and test services are provided to the procurement initiator from a central location (on both the Greenbelt and Wallops facilities), to which most product is delivered from GSFC subcontractors. As part of procurement initiation activities, the initiator establishes instructions (e.g., Cert Log) for receiving inspection and test and provides these to the central receiving function. This function is responsible for incoming inspection and test, control of nonconforming hardware, subcontractor corrective action, collection of subcontractor performance data, product identification and traceability and coordination with applicable Contracting Officers. In addition, the central receiving function coordinates all necessary notices, urgent releases and deliveries with initiators/end users. With the exception of specific, product-oriented receiving inspection/test instructions provided by the procurement initiator, all receiving inspection and test procedures and records are maintained by the central receiving function.

4. Recommendation

A subcommittee was formed to consider the pros and cons of the above three options. The subcommittee consisted of members of the QMSC representing codes 200, 300, and 600, as well as subject matter experts from Codes 230, 752.3 and Unisys. As a result of individual and group consideration, the pros and cons associated with each option were

documented (reference attachment). Subcommittee results were presented to the full QMSC which concurred in the proposed recommendation to pursue option C, a central receiving inspection and test process. Factors associated with option C which led to this recommendation were:

- minimizes documentation and records
- minimizes personnel resources
- minimizes physical space usage
- maximizes center-wide process consistency
- concentrates process responsibility and equipment
- focuses collection of subcontractor performance data

In addition to the above, it is the opinion of the QMSC that implementation of the requirements associated with receiving inspection and test enumerated in section 2 of this paper cannot be efficiently accomplished or consistently maintained with options A or B. While these two approaches are theoretically viable, the dispersion of responsibilities associated with documentation and records requires a degree of discipline at the individual and project levels which has not been demonstrated to this point.

Although no formal benchmarking was performed, experience with private industry aeronautics suppliers which have established quality systems to imposed quality assurance requirements (e.g., MIL-Q-9858, NHB 5300.4(1B), Section 8 of SPAR-3, ISO 9001) reveals that the vast majority have a centralized function for receiving inspection and test. Exceptions to this approach are concentrated in not-for-profit institutions, such as university labs and some government research facilities. Typically, these facilities either have not historically maintained quality assurance systems in accordance with any recognized specification or are of such a small and/or short term character (e.g., university “skunk work” labs) that a central receiving function is not necessary for efficient operations or as an investment in the future.

A system level procedure (SLP) addressing the receiving inspection and test process will be developed by the QMSC. This SLP and others affected by this process (e.g., purchasing, corrective action, control of nonconforming product) will provide the details of the process. However, in adopting this recommendation, the QMSC is making the following basic assumptions about the process:

- the procurement initiator, not the receiving function, determines the extent and type of receiving inspection/test;
- all product within the scope of the GSFC quality management system will be delivered to the central receiving inspection/test area (both at GSFC and WFF), with pre-determined exceptions for product which is delicate, environmentally sensitive, overlarge (e.g., spacecraft and instruments), or requires receiving inspection/test which can only be accomplished elsewhere at GSFC;
- turn-around-times in receiving inspection and test will be one day or less, barring nonconformances or extensive inspection/test instructions from the initiator.

5. Issues

There are obvious issues associated with the establishment of a central receiving inspection and test process at the GSFC Greenbelt and WFF. Aside from the natural and expected resistance from some employees to such a fundamental change in product processing, there are practical considerations which will require consideration and resolution by GSFC management. These include:

- Providing the physical space for the process and associated equipment
- Determining the personnel resources
- Budgeting and payment policy for receiving inspection and test services

The QMSC is ready to consider these issues with affected personnel/organizations and provide recommended options to GSFC management in concert with associated SLP development.

The QMSC urges your concurrence with this recommendation. Once received, we can continue with implementation planning of this important element of ISO 9001. Should you have any questions, please feel free to contact me.

Attachment

GSFC Receiving Inspection and Test Options Worksheet

ANSI/ASQC Q9001, ELEMENT 4.10

Sub-element 4.10.1: The supplier shall establish and maintain documented procedures for inspection and testing activities in order to verify that the specified requirements for the product are met. The required inspection and testing, and the records to be established, shall be detailed in the quality plan or documented procedures.

A		B		C	
PROS	CONS	PROS	CONS	PROS	CONS
• Establishes process ownership	• Maximizes documentation • Gross duplication of effort • Depends upon a maximum of disciplined, scattered effort for compliance • New/added duty to procurement initiator	• Maximizes project "tailorability" • Less documentation redundancy than A	• Excessive documentation • Duplication of effort • Added project personnel function • Depends upon multiple, scattered effort for compliance • maximizes space utilization	• Minimizes documentation • Minimizes personnel resources • Focuses records and data for further manipulation • Minimizes space resources • Focuses responsibility	• Tailored documents must be coordinated with non-project personnel • Limits perception of initiator/engineer accountability

Sub-element 4.10.2.1: The supplier shall ensure that incoming product is not used or processed (except in the circumstances described in 4.10.2.3) until it has been inspected or otherwise verified as conforming to specified requirements. Verification of the specified requirements shall be in accordance with the quality plan and/or documented procedures.

A		B		C	
PROS	CONS	PROS	CONS	PROS	CONS
• Immediate individual access to received product	• Maximizes need for multiple holding areas (space) • Verification capabilities needed at maximum number of locations • Schedule tyranny conflicts with verification responsibilities • Maximizes need for environmental controls (e.g., ESD, humidity, security) • Added responsibilities to initiators/project engineers	• Immediate project access to received product	• Need for multiple holding areas (space) • Need for multiple verification capabilities at several locations • Proper environmental controls must be established at all project locations • Added responsibilities to project personnel • Potential for project schedules to conflict with receiving inspection process discipline	• Minimizes space requirements • Concentrates needed verification capabilities • Environmental concerns concentrated in one area • Minimizes personnel resources • Provides safeguard against unplanned and undocumented project risk	• Immediate project access to delivered project denied (w/o proper planning) • Space must be found to accommodate this Center service to projects

Sub-element 4.10.2.2: In determining the amount and nature of receiving inspection, consideration shall be given to the amount of control exercised at the subcontractor's premises and the recorded evidence of conformance provided					
A		B		C	
PROS • Amount and nature of receiving inspection will be determined by initiator in any case	CONS • Suppler verification records maintained by individuals • Individual must assess subcontractor controls based upon cross section of all GSFC procurements with supplier. How would such info be obtained?	PROS • Amount and nature of receiving inspection will be determined by initiator in any case	CONS • Suppler verification records maintained by project • Project must assess subcontractor controls based upon cross section of all GSFC procurements with supplier. How would such info be obtained?	PROS • Promotes establishment of centralized info on subcontractor controls • Centralizes supplier verification record files • Centralizes communications with on-site/DCMC supplier verification activities	CONS • Individual initiators must still determine/plan amount and nature of receiving inspection • Possibly too far removed from the work to be familiar with vendor and processes
Sub-element 4.10.2.3: Where incoming product is released for urgent production purposes prior to verification, it shall be positively identified and recorded in order to permit immediate recall and replacement in the event of nonconformity to specified requirements.					
A		B		C	
PROS • Allows quick release for urgent production	CONS • Promotes inconsistent identification methods • Promotes inconsistent recall methods • Potential for individual goals to overcome quality goals	PROS • Allows quick release for urgent production	CONS • Promotes inconsistent identification methods • Promotes inconsistent recall methods	PROS • Establishes consistent identification methods • Establishes consistent recall methods • Safeguards against undocumented release because of schedule pressures	CONS • Introduces release delay for unplanned urgencies • Could create bottleneck during unplanned large work volume

Sub-element 4.10.5: The supplier shall establish and maintain records which provide evidence that the product has been inspected and/or tested. These records shall show clearly whether the product has passed or failed the inspections and/or tests according to defined acceptance criteria. Where the product fails to pass any inspection and/or test, the procedures for control of nonconforming product shall apply. Records shall identify the inspection authority responsible for the release of product.

A		B		C	
PROS	CONS • Records must be maintained by individual initiators. Required center-wide data gathering (for supplier performance history) becomes very burdensome.	PROS	CONS • Records must be maintained by project. Required center-wide data gathering (for supplier performance history) becomes burdensome.	PROS • Establishes central record file, simplifying the gathering of supplier performance data	CONS • Requires feedback from the end user for vendor performance database to be effective

OTHER RELATED Q9001 REQUIREMENTS

Sub-element 4.6.2(b): The supplier shall define the type and extent of control exercised by the supplier over subcontractors. This shall be dependent upon the type of product, the impact of subcontracted product on the quality of final product, and, where applicable, on the quality audit reports and/or quality records of the previously demonstrated capability and performance of subcontractors.

Sub-element 4.6.2(c): The supplier shall establish and maintain quality records of acceptable subcontractors.

A		B		C	
PROS • More precise and thorough knowledge of suppliers when individual users are doing the evaluation	CONS • Supplier quality records are scattered across the Center • Records are not shared, in order to make most knowledgeable GSFC determination re supplier control or acceptability	PROS	CONS • Supplier quality records are scattered across the Center • Records are not shared, in order to make most knowledgeable GSFC determination re supplier control or acceptability	PROS • Accommodates establishment of GSFC-wide supplier performance data for procurement decision purposes	CONS • Needs feedback from end user

Element 4.7: The supplier shall establish and maintain documented procedures for the control of verification, storage, and maintenance of customer-supplied product provided for incorporation into the supplies or for related activities. Any such product that is lost, damaged, or is otherwise unsuitable for use shall be recorded and reported to the customer.					
A		B		C	
PROS • More tuned to customer-supplied product specifications	CONS • Customer inventory and status records difficult to locate • Redundancy of procedures and files across Center	PROS • See A	CONS • See A	PROS • Procedure/Records duplication minimized	CONS • Requires input from end user to determine acceptability
Element 4.8: Where appropriate, the supplier shall establish and maintain documented procedures for identifying the product by suitable means from receipt and during all stages of production, delivery, and installation. Where and to the extent that traceability is a specified requirement, the supplier shall establish and maintain documented procedures for unique identification of individual product or batches. This identification shall be recorded.					
A		B		C	
PROS •	CONS • Requires scores/hundreds of control points	PROS •	CONS • Requires many control points	PROS • Centralizes traceability from receipt responsibility	CONS • Potential for bottlenecks during unplanned high volume periods

<table>
<tr><td colspan="6">Sub-element 4.13.1: The supplier shall establish and maintain documented procedures to ensure that product that does not conform to specified requirements is prevented from unintended use or installation. This control shall provide for identification, documentation, evaluation, segregation (when practical), disposition of nonconforming product, and for notification to the functions concerned.</td></tr>
<tr><td colspan="2">A</td><td colspan="2">B</td><td colspan="2">C</td></tr>
<tr><td>PROS
•</td><td>CONS
• Segregation/identification procedures and physical space must be reproduced across Center</td><td>PROS
•</td><td>CONS
• See A</td><td>PROS
• Minimizes documentation and physical space burden
• Can coordinate action of parties responsible for disposition</td><td>CONS
• Potential bottleneck</td></tr>
<tr><td colspan="6">Sub-element 4.14.1 (partial): The supplier shall establish and maintain documented procedures for implementing corrective and preventive action.

Sub-element 4.14.2 (partial): The procedures for corrective action shall include: ……..(b) investigation of the cause of nonconformities relating to product, process, and quality system, and recording the results of the investigation; …..(d) application of controls to ensure that corrective action is taken and that it is effective.</td></tr>
<tr><td colspan="2">A</td><td colspan="2">B</td><td colspan="2">C</td></tr>
<tr><td>PROS
•</td><td>CONS
• Tyranny of schedule/other responsibilities prevents supplier corrective action</td><td>PROS
•</td><td>CONS
• See A</td><td>PROS
• Can take Center-wide view of the value of corrective action requests to suppliers
• Supplier corrective actions feeds into central supplier performance database</td><td>CONS
• Supplier CA evaluation may require end user input</td></tr>
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OTHER REQUIREMENTS

DD 250's

A		B		C	
PROS • Best placed to determine acceptability of product	CONS • Schedule pressures promotes rubber-stamping • DD250 a secondary concern of engineer	PROS • See A	CONS • See A	PROS • Establishes timeline for DD250 sign-off • Can track acceptance trail for procurement	CONS • Requires end user to define "acceptance" for payment

Warranties

A		B		C	
PROS •	CONS • Very difficult to establish warranty timeline	PROS •	CONS • See A	PROS • Can establish timeline for warranty purposes for CO	CONS •